MCBSF 6.7

001688OY022901_PT094

Interim Remedial Action Report

Final Groundwater Operable Unit (OU3)
McCormick & Baxter
Creosoting Company
Portland, Oregon

Task Order No.: 71-03-02

September 2003

Prepared for:

OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY

Prepared by:

ECOLOGY AND ENVIRONMMENT, INC.
333 SW Fifth Avenue, Suite 608
Portland, Oregon 97204

Michael F. Gearheard, Director
Environmental Cleanup Office
United States Environmental Protection Agency
Region 10

Paul Slyman, Administrator
Northwest Region
Oregon Department of Environmental Quality

Table of Contents

INTERIM REMEDIAL ACTION REPORT
GROUNDWATER OPERABLE UNIT (OU3)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON
SEPTEMBER 18, 2003

I. INTRODUCTION

This Interim Remedial Action Report describes the current status of the selected remedy for the final groundwater operable unit (OU3), primarily focusing on the installation of a combined sheet pile and soil-bentonite (S-B) barrier wall. This report is considered "interim," because the barrier wall has only recently been installed (completed in July 2003), and performance of the wall and achievement of cleanup goals has yet to be determined. Following determination of wall performance and achievement of groundwater remedial goals, a Final Remedial Action Report for OU3 will be issued.

Site Location, Setting, and Operational History

The McCormick & Baxter site is located on the Willamette River in Portland, Oregon, downstream of Swan Island and upstream of the St. John's Bridge (Figure 1). The Willamette River flows to the northwest in the vicinity of the site. The site is located on an area that was constructed by placement of dredged material sometime in the early 1900s. The site, which encompasses approximately 43 acres on land and 15 acres in the river, is generally flat and lies between a 120-foot (ft) high bluff along the northeastern border and a 20-ft high bank along the Willamette River to the southwest. A sandy beach is exposed at the base of the bank except during brief periods of high river stage (generally late winter or early spring). The site is bordered by industrial properties along the river and by a residential area on the bluff. The entire perimeter of the McCormick & Baxter property is fenced, and warning signs are posted on the fence.

The McCormick & Baxter Creosoting Company began wood-treating operations in 1944 that continued until October 10, 1991. Four retorts at the site were used for different wood-treatment processes, which included creosote in oils, pentachlorophenol (PCP) in aromatic oils, water-based treatment (i.e., chromium and ammoniacal copper arsenate and ammoniacal copper zinc arsenate), and Cellon (PCP in liquid butane and isopropyl ether).

Between 1950 and 1965, waste oil containing creosote and/or PCP was applied to site soil for dust suppression in the central process area. Liquid process wastes were reportedly discharged to a low area near the tank farm prior to 1971. Contaminated soil was removed from this area in the mid-1980s. From 1968 until 1971, process wastes were disposed of in the former waste disposal area (FWDA) in the southwest portion of the site.

The property is accessed via the partially paved North Edgewater Street, which leads from Willamette Boulevard to the main gate near the northwest corner of the site. The driveway leading into the property and the parking lot are paved; the remainder of the property is unpaved, covered with gravel, or vegetated. Two construction trailers are maintained in the parking lot area to provide office space, storage, and personnel decontamination facilities for ongoing site activities. The remaining above-ground structures on site include: a former shop building that is used to house a water treatment system (no longer in operation) and other equipment/supplies; a freight container located near the western property corner, also used to house a water treatment system (no longer in operation); four above-ground tanks used for water treatment operations (no longer in operation); a small metal shed containing a water service backflow prevention device; several utility poles; and a wood retaining wall and pilings along the river bank. All other above-ground structures and buildings were removed during previous Remedial Action (RA) activities.

The site had a wastewater discharge outfall (Outfall 001) that was used for cooling water when the plant was operating. Contact wastewater also was discharged from this outfall in the early years of operation. Three stormwater outfalls (002, 003, and 004) were also present along the river. Outfalls 001 and 002 were permitted under the National Pollutant Discharge Elimination System (NPDES). Following plant shutdown, the Oregon Department of Environmental Quality (DEQ) placed earthen berms around stormwater collection sumps at the site as an early response action to minimize off-site discharge. The outfalls were later removed in 1999 during Phase I of the soil remedy. Currently, stormwater at the site infiltrates into the subsurface.

Three main contaminant source areas exist at the site:

- The former waste disposal area (FWDA) - Located at the western corner of the site adjacent to the Willamette River.

- The central process area - The former location of the retorts, PCP mixing shed, and ACZA storage areas.

- The tank farm area (TFA) - Located in the central area of the site that is the former location of the main tank farm, the large creosote tank, and several other wood-treatment process-related tanks or process areas.

Other source areas include the southeast disposal trench area, located southeast of the TFA, which received overflow of oily wastes from the system pits and tank farm; miscellaneous small waste disposal areas; and near monitoring well MW-1 located near the entrance to the property.

Regulatory and Enforcement History

In August 1983, McCormick & Baxter performed a preliminary site investigation (AquaResources 1983) and notified DEQ of possible off-site releases near a former waste disposal area. Subsequently, CH2M Hill was retained by McCormick & Baxter to perform a site investigation, which was completed in 1985. The investigation report concluded that soil and groundwater contamination existed at the site, but that no emergency actions were necessary to protect off-site populations.

On November 24, 1987, a stipulation and final order was signed by McCormick & Baxter and DEQ, requiring McCormick & Baxter to perform a number of remedial action activities. Not all of these requirements were completed by the time the facility was closed on October 10, 1991. DEQ conducted a Remedial Investigation and Feasibility Study (RI/FS) from September 1990 through September 1992.

DEQ's notice of a proposed remedial action for the site was published in the *Secretary of State's Bulletin* on January 1, 1993, in *The Oregonian* on January 4, 1993, and in *Between the Rivers* on March 1, 1993. DEQ elected not to finalize the proposed remedial action at the McCormick &

Baxter site in 1993 due to the pending addition of the site to the National Priorities List (NPL) by the United States Environmental Protection Agency (EPA). DEQ instead began to implement a number of interim removal actions (IRAs), which were elements of the 1993 DEQ-proposed plan, while awaiting a final decision from EPA on inclusion of the McCormick & Baxter site on the NPL. The McCormick and Baxter site was added to the NPL on June 1, 1994.

Since completion of the RI/FS in 1992, DEQ has conducted several IRAs and additional site characterization. Based on implementation and/or completion of the IRAs, collection of additional site data since the 1992 FS, and experience gained at other wood-treating sites, DEQ chose to revise the 1992 FS to incorporate new data and updated remedial alternatives. The Revised FS Report describes updated remedial action alternatives for the McCormick & Baxter site and incorporates IRAs conducted since the 1992 FS.

The Proposed Plan describing DEQ's and EPA's preferred remedy was issued on October 30, 1995. After considering the comments received during the public comment period, DEQ and EPA issued the Record of Decision (ROD) specifying the selected remedy in March 1996. A ROD Amendment was issued in March 1998, which changed a portion of the soil remedy from on-site treatment to off-site disposal.

Operable units (OUs) at the site that were addressed by the 1996 ROD include the interim groundwater extraction and treatment system (OU1), soil (OU2), final groundwater (OU3), and sediment (OU4). The Remedial Action Report for the interim groundwater treatment system (OU1) was issued in 2000.

In August 2002, EPA and DEQ issued an Explanation of Significant Difference (ESD) that provided the justification for implementing the contingency groundwater remedy specified in the ROD. This contingency called for installation of a vertical barrier wall in the event that non-aqueous-phase liquid (NAPL) could not be reliably contained using hydraulic methods, or if it would improve the overall cost-effectiveness of the groundwater remedy.

Nature and Extent of Groundwater Contamination

Contaminants on the site are chemicals used in the wood-preserving industry, including polynuclear aromatic hydrocarbons (PAHs), about 85% of which are composed of creosote constituents, PCP, arsenic, chromium, copper, and zinc. Polychlorinated dibenzo-*p*-dioxins and dibenzofurans (dioxins/furans), which are trace constituents of PCP, were also found in groundwater at the site.

The main contaminants in groundwater are PAHs, PCP, and metals associated with wood-treating solutions. The primary source areas of the groundwater contamination include the TFA and creosote tank, the FWDA, the central process area, and, to a limited extent, a localized area in the southeast waste disposal trench and an unknown source area near MW-1. Wood-treating contaminants are not generally soluble in water, and the contaminants either float on the water table or continue to sink depending on the density of the waste compared to that of water. Groundwater quality at the site has also been impacted by dissolved-phase contaminants. The groundwater is not currently used for drinking water.

Releases of NAPL contaminants from the main source areas at the site, in particular the TFA and FWDA, have primarily affected the shallow aquifer. As the pure-phase NAPL has migrated toward the river, it has also spread downward vertically, affecting a layer of sand adjacent to the river. Two distinct NAPL plumes are present at the site, one in the TFA and the other in the

FWDA. These contaminant plumes contain lighter-than-water non-aqueous-phase liquid (LNAPL) and/or denser-than-water non-aqueous-phase liquid (DNAPL) that primarily consists of creosote compounds, as well as dissolved-phase contaminants. Smaller NAPL plumes are present near MW-1 and the former location of Butt Tank 1 in the southeast corner of the site.

The FWDA NAPL plume affects approximately 4 acres of soil and 5 acres of sediment. The origin of this plume is waste oils, stormwater from system pits, and other liquid wastes that were disposed of in the FWDA. This mixture migrated vertically to the water table (approximately 30 feet below ground surface [BGS]) and then laterally toward the river, as both LNAPL and DNAPL. Monitoring and extraction wells have contained up to 8 feet of LNAPL and 21 feet of DNAPL, with visible DNAPL present in soil samples collected at depths up to 88 feet BGS.

The TFA plume affects approximately 8 acres of soil and 6 acres of sediment. The origin of this plume is the former tank farm, large creosote tank, creosote retorts, butt tanks, and southeast waste disposal trench, which either had periodic spills or were used for disposal of waste oils (creosote and PCP) and other liquid wastes. This mixture migrated vertically to the water table (approximately 30 feet BGS) and then laterally toward the river, spreading as both LNAPL and DNAPL. Wells in this NAPL plume have contained up to 3 feet of LNAPL and 10 feet of DNAPL, with visible DNAPL present in soil samples collected at depths up to 62 feet BGS.

II. OPERABLE UNIT BACKGROUND

The remedial action objectives (RAOs) presented in the ROD for groundwater and NAPL contamination at the site include:

- Preventing human exposure to or ingestion of groundwater with contaminant concentrations in excess of federal and state drinking water standards or protective levels;
- Minimizing further vertical migration of NAPL to the deep aquifer;
- Preventing groundwater discharges to the Willamette River that contain dissolved contaminants that would result in contaminant concentrations within the river in excess of background concentrations or in excess of water quality criteria for aquatic organisms;
- Minimizing NAPL discharges to the Willamette River beach and adjacent sediment to protect human health and the environment; and
- Removing mobile NAPL to the extent practicable to reduce the continuing source of groundwater contamination and potential for discharge to Willamette River sediment.

The remedy for groundwater consists of the following major elements:

- Enhancement of NAPL recovery using pure-phase extraction and/or groundwater/NAPL extraction (implemented 1993 to 1998; ongoing as manual extraction);
- Evaluation by pilot testing of innovative technologies, such as surfactant flushing, to increase the effectiveness and the rate of NAPL removal (has not yet been performed);
- Treatment of groundwater using methods such as dissolved air flotation (DAF), filtration, carbon absorption, extended aeration/packed bed bioreactor, or other biological treatment (implemented 1994; suspended September 2000);
- Discharge of treated groundwater to the Willamette River in accordance with

substantive NPDES requirements (implemented 1994; suspended September 2000);

- Treatment and/or disposal of NAPL and other treatment residuals off site in accordance with applicable hazardous waste regulations (implemented 1994; ongoing);
- Monitoring to ensure that site-specific alternate concentration limits (ACLs) are met at compliance monitoring locations (implemented March 1996; ongoing);
- A contingency to install a vertical physical barrier in the event that mobile NAPL cannot be controlled reliably using hydraulic methods or to improve the overall cost-effectiveness of the groundwater remedy (invoked in the August 2002 ESD); and
- Installation of controls that restrict groundwater use at the site (implemented 1994).

Because of the extensive NAPL contamination, EPA and DEQ determined that it was not technically practicable to restore the groundwater aquifers under the site to drinking water quality; therefore, site-specific contaminant alternate concentration limits (ACLs) that are protective of the environment were developed. These protective ACLs were developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121(d)(2)(B)(ii) for dissolved contaminants in groundwater discharging to the Willamette River.

Furthermore, DEQ and EPA determined that active restoration of the aquifers to non-zero Maximum Contaminant Level Goals (MCLGs) or Maximum Contaminant Levels (MCLs) is technically impracticable due to the extensive NAPL contamination of the saturated zone beneath the site and the river sediment. DEQ and EPA also determined that the risk from potential degradation products in the groundwater can be managed through institutional controls. Additionally, no significant increase of degradation compounds has been found in surface water and no significant increase of contaminants will occur in sediment from groundwater. The ACLs were established to protect aquatic organisms based on EPA/state water quality criteria and will not result in statistically significant increases of contaminant concentrations above background in the Willamette River. The ACLs for groundwater are presented as Table 1.

Table 1
ACLs for Groundwater (Shallow Aquifer)

Analyte	**Groundwater Concentration (mg/L)**
Total PAHs	43
Pentachlorophenol	5
Dioxins/Furans	2×10^{-7}
Arsenic (III)	1
Chromium (III)	1
Copper	1
Zinc	1

Key:
mg/L = Milligrams per liter.

Relevant to the final groundwater remedy (OU3), the interim groundwater remedy (OU1) was implemented at the site to separate NAPL and to treat groundwater removed from the TFA through total fluid extraction efforts. The ROD provided that this interim groundwater system would continue to operate and be maintained while undergoing upgrading and enhancements to attain the full functional ability to meet the groundwater RAOs for the site. A dissolved air flotation (DAF)/granular activated carbon (GAC) system was installed to treat the extracted groundwater from the TFA. In addition, pure-phase NAPL extraction was performed in the TFA and the FWDA. Monitoring wells in the FWDA were used for pure-phase NAPL extraction only, since groundwater was not extracted.

The goals of the NAPL extraction were to reduce the NAPL pools to residual levels (to the extent possible) and to minimize or prevent active migration of the NAPL into the Willamette River and its sediment. The residual level (i.e., the percentage of NAPL left in soil pore spaces) necessary to totally prevent pool migration is unknown. However, wells were pumped (either through total fluid or pure-phase extraction) until oil was not visible in the discharge. Wells were monitored periodically after that time to ensure an active pool had not reaccumulated at a given well location.

In fall 1998, the DAF/GAC system was removed from the TFA and replaced with oil/water separation, resin columns, and GAC.

Currently, NAPL extraction at the site includes manual LNAPL skimmers in select monitoring wells and manual LNAPL and DNAPL extraction using pneumatic pumps. The automated extraction and treatment systems in the TFA and FWDA were shut down in September 2000 because of a sitewide decrease in NAPL occurrence in monitoring wells and because similar quantities of NAPL can be extracted manually with less labor effort and cost than that associated with the treatment systems. Approximately 1,968.4 gallons of NAPL have been extracted at the site from 1996 through June 2003.

Routine groundwater/NAPL depth and thickness measurements and semiannual groundwater sampling continue to be conducted at the site. As indicated in DEQ's 2001 *Five-Year Review Report,* based on the overall performance of the groundwater remedy, the remedy appears to be meeting the ACLs for groundwater at the site.

However, ongoing monitoring indicated that the groundwater remedy was not preventing the discharge of NAPL from the site to the Willamette River and its sediment. For example:

- Along the beach, several monitoring wells downgradient from the FWDA continued to show measurable NAPL thicknesses;
- NAPL seeps were observed to be discharging to Willamette Cove as a result of extreme regional and sitewide low-water conditions;
- NAPL seeps on the beach downgradient from the FWDA have been consistently observed during low river stages;
- Hydraulic control of NAPL or groundwater has not been established in either the TFA or the FWDA; and
- Groundwater flow gradients toward the river, documented in past quarterly and semiannual reports, have been measured.

Because NAPL discharges to the river were continuing, DEQ and EPA elected to evaluate the contingency for barrier wall installation. A *Barrier Wall Focused Technology Evaluation* (FTE) was prepared in 2001 by DEQ's contractor/consultant, Ecology and Environment, Inc. (E & E), to assess barrier wall alignments, installation technologies, implementability, associated costs, and other considerations. Based on findings from the FTE and ensuing discussions, DEQ and EPA elected to implement construction of a combined sheet pile and soil-bentonite (S-B) barrier wall to attain hydraulic control of NAPL and groundwater and reduce off-site NAPL migration. The selected alignment consisted of a fully encompassing wall, of which the downgradient portion (paralleling the Willamette River) would be constructed of sheet pile, and the upgradient/upland portion would be constructed with S-B backfill using the slurry trench method.

In August 2002, EPA and DEQ issued the ESD, which provided the justification for implementing the vertical barrier wall. The remedial design for the barrier wall was conducted in late 2001 and early 2002, with design completion in September 2002. The design was prepared by E & E with input from the entire project team including the DEQ, EPA, USACE, and NOAA. Significant design issues included determination of wall depth that would ensure NAPL containment, finalizing the wall geometry and material specification (i.e. steel sheet pile and soil-bentonite slurry), and accommodating a high-pressure sewer line adjacent to the site. A Biological Assessment for construction of the barrier wall was submitted by EPA to NOAA Fisheries and the US Fish and Wildlife Service in June 2002. A Biological Opinion pursuant to Section 7 of the Endangered Species Act, was issued by NOAA Fisheries in August 2002.

In October 2002, E & E prepared contract documents for the construction of the combined barrier wall, which included contract requirements, technical specifications, and drawings. Thereafter; the DEQ, with assistance from the Department of Administrative Services (DAS), solicited bids for construction of the wall. On December 3, 2002, the contract was awarded to Remtech, Inc., of Tacoma, Washington. Notice to Proceed was issued on January 7, 2003.

III. CONSTRUCTION ACTIVITIES

A combined sheet pile and S-B barrier wall, shown in Figure 2, was installed to help fulfill two of the primary RAOs at the site for groundwater and NAPL: 1) preventing groundwater discharges to the Willamette River that contain dissolved contaminants, and 2) minimizing NAPL discharges to the Willamette River beach and adjacent sediments. Construction activities related to the barrier wall were initiated in April 2003 with substantial completion in August 2003. The barrier wall project was completed in September 2003 including contractor documentation submittal. The paragraphs below provide a summary description of the activities performed to construct the wall.

Sheet Pile Wall

The definable features of the sheet pile wall construction including mobilization, site preparation, and installation are described below.

Mobilization

Mobilization for the sheet pile wall included delivery and on-site assembly of two cranes (Manitowac 4000W and 3900W Vicon); mobilization and assembly of a vibratory hammer (I.C.E. Model 4450) and power unit (I.C.E. Model 570); and the delivery and staging of sheet piles (model AZ 25, manufactured by International Sheet Piling Company, Luxembourg; and distributed by Skyline Steel Corporation, Gig Harbor, Washington).

Site Preparation

Site preparation included clearing work zones; installation of erosion control measures (e.g., silt fencing and biobags) between the working area and the Willamette River; and woody debris displacement along the river to allow for working platform construction. Once the erosion control measures were installed, an approximately 30-foot-wide working platform was constructed along surveyed alignment stakes using a dozer. The platform provided easy and safe access for laborers and equipment and a level working surface for sheet pile installation.

Installation

Approximately 1,466 linear feet (99,000 square feet) of sheet piles were installed along the bank of the Willamette River using a panel driving technique. The installation technique consisted of setting and partially driving six to eight sheet pile pairs (a panel). Each newly placed pair was checked for plumb and alignment. Alignment was controlled using a template of two welded I-beams, which was placed along the surveyed wall alignment. Before the first panel was driven to grade, a second panel was set and partially driven. After setting the second panel, the sheet piles in the first panel were driven in reverse order of setting.

Each sheet pile pair was lifted and lowered into place using a crane. After the pair was fed into the interlock of the previously set pair, the sheet pile drivers were able release the sheet pile from the crane with the aid of specialized vice clamps and trip lines. Actual driving of the sheet was accomplished using a vibratory hammer suspended and lowered onto the sheet pile using the second crane. Hydraulic lines connected the power/control unit to the hammer. Using the control switch panel, the sheet pile drivers were able to open and close the vice clamp, turn the vibration on and off, and change the frequency at which the vibrator operated.

Two areas of difficult driving (refusal areas) were encountered during the installation. One area was encountered near the bulkhead/wood retaining wall region (STA 8+00 to 9+00) and another at the north end tie-in into the S-B wall (near STA 15+00) in the FWDA. Multiple attempts using several different approaches were made to get refusals to plan grade. In an effort to ascertain the cause of the refusal, a drill rig and crew were mobilized to the site. Several borings were performed adjacent to and within 2 feet of the refusal sheets. Borings were advanced to depths well below the wall design depth. No obvious obstruction was encountered. It is hypothesized that the refusals were due to a combination of encountering tight sandy formations and the total surficial friction on the sheets. Despite significant efforts, a total of six sheets met with refusal prior to design penetration depth (three in the bulkhead area and three in the FWDA). The penetration depths of these refusal sheets varied from -28 feet National Geodetic Vertical Datum (NGVD) to -42 feet NGVD (18 to 5 feet from design depth, respectively). During hard driving, the sheets would often fatigue and fail in the vice grips of the vibratory head. The six refusal sheets are marked with the bottom elevation of the sheet (in NGVD) torch-cut into the sheet's top end. The tops of all the sheets, except those in ground elevation transition areas, were left with approximately 2 feet of stickup above the ground surface.

Soil Bentonite Barrier Wall

The following paragraphs briefly describe the mobilization, site preparation, and installation procedures implemented to install the S-B portion of the barrier wall.

Mobilization

Specialized equipment mobilized for the construction of the S-B barrier wall included a long boom excavator (Komatsu PC1100, 110 metric tons) allowing excavation to 72 feet BGS; a verturi slurry mixer; and a slurry pump. Materials delivered included clay (from Wilkin's trucking company) and Naturalgel bentonite (manufactured by Wyo-Ben, Inc.).

Site Preparation
Site preparation involved survey staking of the wall alignment; clearing/grubbing of the work area; construction of a working platform; and excavation of a slurry mixing pond.

Installation
The installation of the S-B wall consisted of trench excavation; slurry preparation and conveyance; S-B mixing and placement; verification testing; and installation of a protective cap.

The process of S-B wall construction is controlled by specific gravities. The excavated trench was held open using a slurry mix of bentonite and water, which is later displaced by the denser S-B mixture. Upon trench excavation, slurry was pumped from the slurry mixing pond to the trench via conveyance piping (6-inch HDPE). As the long boom excavator operator advanced along the wall alignment and reached design depth, S-B mixture was placed within the trench, displacing the slurry. The S-B mixing operation occurred concurrently with excavation within the interior of the wall's perimeter. The S-B mixture consisted of soil excavated from the trench, slurry from the trench, imported clays, and dry bentonite. S-B mixing and placement was accomplished by excavators and a bulldozer. To thin the S-B mixture, the excavator operator mixed in slurry from the trench. To thicken the mixture, clay and dry bentonite was added. Remtech subcontracted a slurry trench specialist (from Geo-Solutions, Inc., of Pittsburg, Pennsylvania) who used field laboratory equipment to run quality control tests on the mixtures and directed the work crew during the wall construction. The specialist was also responsible for collecting S-B mixture samples (prior to placement), which were sent to an off-site laboratory (Sierra Testing Labs in El Dorado Hills, California) for measurement of required parameters such as permeability. Following wall installation, in situ performance verification testing was also performed at five locations along the wall alignment. Borings were advanced at each location, from which three S-B samples were collected at varying depths using a California modified split spoon. The samples were then sent to an off-site laboratory for required testing including sieve analysis, moisture content, Atterberg limits, density, and permeability. All test results were acceptable.

Once installation of the S-B barrier wall was completed, a protective cap was installed to minimize the potential for S-B wall desiccation. The cap consisted of a minimum of 5 feet of relatively clean site soil (removed and segregated during the installation procedure) placed above the S-B wall in lifts and compacted with a roller. Permanent crossings, constructed of steel plates and traffic cones, were also installed at two locations atop the S-B wall to provide a stable surface for vehicles crossing the wall and to prevent wall damage from vehicle traffic. An approximately 2-foot-high soil berm was also constructed along the entire S-B wall perimeter to prevent vehicles from crossing the wall outside of the permanent crossings.

Additional Activities
Additional activities performed during the construction of the barrier wall included the following:

- Excavation of approximately 1,500 cubic yards of highly contaminated soils from an inoperable interceptor trench, located shoreward and outside the sheet pile wall near the TFA. The excavated soils were buried on site in a disposal cell within the barrier wall limits and covered with a minimum of 4 feet of relatively clean site soils;
- Removal of treated lumber from the shoreline along the Willamette River; and
- Slope stabilization by grading (approximately 2:1) and installation of an erosion control mat along the Willamette River bank for the entire length of the sheet pile wall.

IV. CHRONOLOGY OF EVENTS

Following is a list of major events for the groundwater remedy (OU3). Note that major events associated with the interim groundwater extraction and treatment system (OU1) have also been included, since they are relevant to the groundwater remedy.

Date	Event
September 1990	DEQ begins RI/FS process at the site.
February 1993	Pure-phase NAPL extraction system in operation in the TFA and FWDA. Total fluids extraction operational in the TFA.
December 1994	Pilot Wastewater Treatment system installed in the TFA.
October 1995	Revised RI/FS and Proposed Plan for the M&B site released to the public.
March 1996	ROD signed.
September 2000	Shutdown of automated NAPL extraction and treatment systems in the TFA and FWDA.
September 2000	DEQ issued the *Remedial Action Report for the Interim Groundwater Treatment System Operable Unit (OU1)*
Ongoing	Manual NAPL extraction and groundwater monitoring.
September 2001	DEQ issued the *Five-Year Review Report.*
August 2002	DEQ and EPA issued the *Explanation of Significant Difference.*
October 2002	Remedial Design (*Combined Sheet Pile and Soil-Bentonite Barrier Wall)* submittal and approval.
December 3, 2002	Barrier wall construction contract award.
January 7, 2003	Barrier wall construction contractor Notice to Proceed.
April 1, 2003	Mobilization for barrier wall construction.
July 31, 2003	Barrier wall final inspection.
August 12, 2003	Substantial completion of construction activities.
September 2003	Clustered wells installed for barrier wall performance monitoring.
September 30, 2003	Barrier wall project completion.

V. PERFORMANCE STANDARDS AND CONSTRUCTION QUALITY CONTROL

E & E, under contract with the DEQ, prepared and implemented a *Construction Quality Assurance Plan, March 2003* (CQAP) as an on-site daily guidance for oversight of the RA contractor (Remtech) and quality control during construction activities associated with the barrier wall. Included in the CQAP are procedural guidelines for construction management including quality control (QC) and quality assurance (QA), described below; biological monitoring and pollution control plans; health and safety plans; standard operating procedures; archaeological monitoring protocol; procedures for daily construction reporting; and a project organization chart.

Quality Control

Construction quality control (QC) was achieved through assurance and verification that adequately trained, certified, and skilled personnel performed QC measures. The contractor's Quality Control Inspector (QCI) was responsible for performing the daily on-site QC duties. Those duties included documentation, maintaining a QC checklist, overseeing QC testing, inspecting critical items, and implementing corrective measures if quality-related issues arose.

Quality Assurance

QA procedures included periodic inspections and audits by oversight engineers and the project engineer of QC procedures. Inspections included but were not limited to QC documentation, QC testing results, and testing procedures. All QC data supplied by the contractor were reviewed for testing adequacy and compliance with the plans and specifications.

Health and safety

All contractors and consultants performing work on the site are responsible for developing and implementing their own site safety plans in accordance with the provisions of the Occupational Safety and Health Administration (OSHA) Standards (29 CFR 1910) and General Construction Standards (29 CFR 1926), including OSHA Hazardous Waste Operations and Emergency Response, Interim Final Rule (29 CFR 1910.120). Compliance with all other applicable federal, state, and local laws and regulations is also required.

Protective clothing, such as a hard hat, steel-toed boots, safety vests, and safety glasses, was required for entry into the site's work zones (exclusion zone). The primary physical hazards at the site included heavy equipment operation; trench excavation; noise; slips; trips; and falls. During slurry trench excavation activities through highly contaminated areas (e.g., FWDA), there was a potential for contact with contaminated soil and/or groundwater. The major concern was dermal contact and/or ingestion of the contaminated matter and inhalation of vapors and/or contaminated particulates (i.e., dust). Air quality monitoring was performed by the contractor throughout the RA. On several occasions, workers donned air-purifying respirators (APRs) for respiratory protection when airborne contaminant concentrations exceeded action levels.

Overall, work was conducted safely at the site during the RA. Daily safety meetings to discuss physical and chemical hazards associated with the day's activities were conducted each morning before work began. Only one minor injury was reported during the RA implementation.

VI. FINAL INSPECTION AND CERTIFICATION

Inspections

E & E oversight engineers continuously performed inspections during implementation of the RA. Two full-time engineers were utilized to inspect construction activities to ensure compliance with design specifications and contract requirements. Any deficiencies and/or nonconformances observed were immediately reported to Remtech and DEQ, and appropriate corrective actions were subsequently taken.

Near substantial completion of the construction, DEQ and E & E performed a walk-through inspection of the site. Based on this inspection, a punchlist was developed by E & E for work items remaining to be completed by the construction contractor. After completion of the punchlist items, a final walk-through inspection was performed by DEQ and E & E, after which it was determined that all required site work items were completed (except for fence restoration, which was completed the following week). The final inspection was performed on July 31, 2003.

As part of the required contract closeout documentation, the RA construction contractor will submit in September 2003 a closeout letter to DEQ stating that all work has been performed in accordance with the contract specifications and is complete in every respect.

VII. OPERATION, MONITORING, AND MAINTENANCE

Operation requirements associated with the groundwater operable unit will involve tasks related to performance monitoring of the barrier wall.

Post-Construction Barrier Wall Performance Monitoring

Water level monitoring will be the main indicator of whether the wall is meeting the performance goals of this RA. A secondary indicator is seep activity, which is monitored visually. New groundwater monitoring wells are being installed in a series of clusters inside and outside the barrier wall at 300- to 400-foot spacing to monitor groundwater gradients. Each monitoring well cluster will include a shallow, intermediate, and deep well to allow measurement of horizontal and vertical gradients.

Approximately 45 new monitoring wells and 27 existing monitoring wells will be utilized for gradient estimation. The proposed monitoring well locations were selected based on a review of the existing groundwater flow patterns at the site and the presence of NAPL. In addition, some well clusters were selected to correspond to observed seep locations along the riverfront and in Willamette Cove. The locations of the new and existing monitoring wells at the site provide adequate monitoring of the entire wall at upgradient and downgradient locations. The spacing between the new monitoring wells meets the recommendations of the EPA guidance document entitled *The Evaluation of Subsurface Engineered Barriers at Waste Site*s (August 1998) regarding subsurface engineered barriers. This document recommends a maximum spacing of 400 feet between monitoring wells, with wells located within 30 feet of the barrier wall for hydraulic monitoring.

The proposed well depth intervals for the new wells are based on the monitoring intervals currently used on site, with wells in the shallow zone, the intermediate zone, and the deeper zone. The shallow zone has slightly higher-permeability sediments than those in the intermediate and deeper zones. The three depth intervals were selected to ensure consistency with historical groundwater monitoring practices at the site. Monitoring water levels at the three depth intervals will allow for estimation of vertical and horizontal flow/gradients around and beneath the wall.

Visual Inspection and Monitoring

Weekly barrier wall performance monitoring will be performed by the DEQ contractor, E & E, until the system is more fully understood. The visual inspections will include monitoring of the existing seep areas in Willamette Cove and along the shoreline in front of the former waste disposal area. During the weekly visual inspections, the entire riverfront will be checked for the presence of new seep areas, sheen on the surface water, and any other anomaly. If site conditions change during the weekly inspections, the DEQ project manager will be notified immediately. The visual inspections will be compared with water level gradients and flow data to identify any trends that may require action.

Performance Monitoring Schedule

It is unlikely that true normal cycle conditions at the site can be fully documented with a high degree of certainty in a one-year cycle. The *Final Barrier Wall Performance Monitoring Plan* prepared by E & E (August 2003) proposed a three-year period to fully document and evaluate seasonal changes in groundwater flow patterns, river stage and flood patterns, and overall performance of the barrier wall. If necessary, during the monitoring program, groundwater data could be used to modify the existing groundwater model developed by E & E (as presented in the *Draft Barrier Wall Groundwater Modeling Report, August 2001*) to predict steady-state conditions at the site. Groundwater measurements will be manually recorded weekly for three years at select site monitoring wells. Groundwater data will be collected from 24 automated water level measuring devices located along the riverfront portion of the wall. Groundwater level fluctuations, tidal, and river stage influences will be evaluated.

Maintenance Requirements

Maintenance requirements for the barrier wall are expected to be minimal unless an unexpected failure occurs. The slurry wall will be tested for integrity every five years via direct measurement and sampling of slurry material. Maintenance requirements include routine inspection and maintenance of the S-B wall protective cap, permanent wall crossings, and perimeter berm. If signs of wall subsidence (e.g., surface depressions) are observed, additional soil material will be placed and lightly compacted to bring the subsided area level with surrounding grade. The two wall crossings will also be routinely inspected and maintained to ensure the crossings remain accessible and visible. Lastly, the perimeter berm will be regularly inspected and additional soil placed, as necessary.

Manual NAPL extraction from select recovery and monitoring wells will also continue to be performed on a regular basis. Extraction results will be presented in the semiannual reports.

VIII. SUMMARY OF PROJECT COSTS

The costs for the RA from August 1, 2002 through September 30, 2003 are $3,800,000 including both capital and operating costs related to the installation and performance monitoring of the barrier wall. Projected annual monitoring and maintenance costs are $300,000 through September 2005. The previous cost estimate contained in the ESD to the ROD, dated August 2002, was $3,948,000 to complete the barrier wall installation and related monitoring points. An annotated breakdown of costs is presented in Table A1.

IX. OBSERVATIONS AND LESSONS LEARNED

During S-B wall installation, a thick layer of buried wood chips was encountered near the south end of the wall. This layer of wood chips was considered an "unforeseen condition," since existing boring data only indicated limited amounts of wood chips of an extent less than that encountered. Although there was adequate boring data along the downgradient portion of the wall (per the original, non-fully encompassing alignment), limited boring data was available for the upgradient portion, including a portion containing the buried wood chips. To avoid this situation, sufficient borings and data should have been collected along the entire fully encompassing wall alignment and thoroughly evaluated and provided to the construction contractor as part of the Contract Documents.

X. CONTACT INFORMATION

Major design and remediation contractor addresses and phone numbers are listed below:

The EPA project manager for the site is Alan Goodman:

USEPA, Environmental Cleanup Office
Alan Goodman
811 S.W. Sixth Avenue
Portland, Oregon 97204
(503) 326-3685

The DEQ project manager for the site is Kevin Parrett:

Oregon Department of Environmental Quality, Northwest Region
Kevin Parrett
2020 SW 4th Avenue, Suite 400
Portland, Oregon 97201
(503) 229-6748

DEQ used the following contractor for construction of the barrier wall:

Remtech, Inc.
Mark Henry
1803 99th Street East
Tacoma, Washington 98445
(253)537-4559

DEQ used the following contractor for design and construction oversight of the barrier wall and performance monitoring:

Ecology and Environment, Inc.
John Montgomery
333 S.W. Fifth Avenue, Suite 608
Portland, Oregon 97204
(503) 248-5600

APPENDIX A

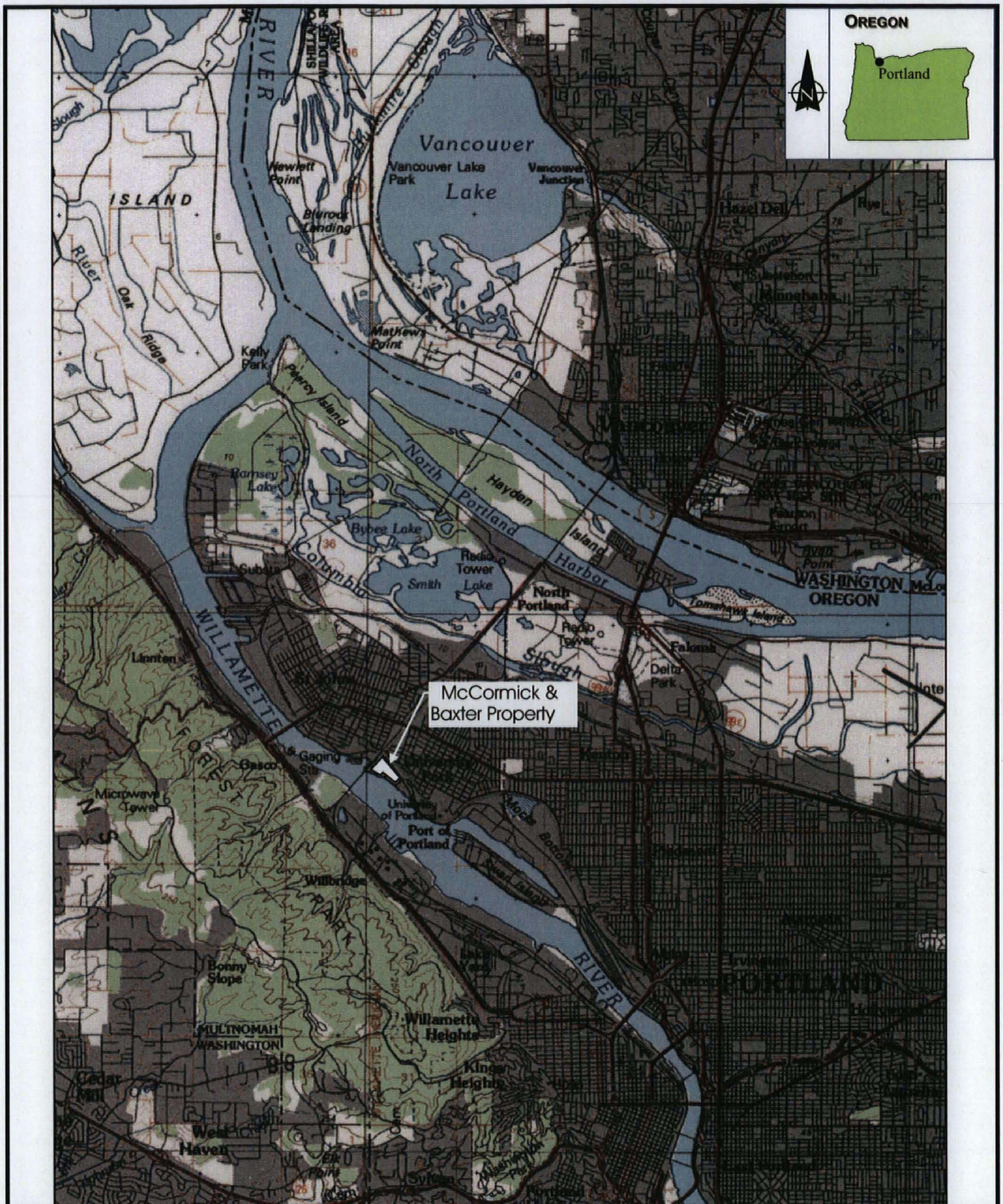
COST AND PERFORMANCE SUMMARY
FINAL GROUNDWATER OPERABLE UNIT (OU3)
McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

TABLE A1—DETAIL OF RA PROJECT COSTS[a]

Cost Element	Cost (2003 $$)
RA Capital Costs:	
Barrier wall installation, including performance monitoring wells	$3,500,000
RA Operating Costs:	
Site operation, monitoring, and maintenance	$300,000
Total RA Cost	$3,800,000
Projected Annual Site GW Operation, Monitoring, and Maintenance Costs (through 2005)[b]	
Site operation, monitoring, and maintenance	$300,000

[a] Reported costs are those incurred from August 1, 2002 (the beginning of the current Cooperative Agreement V-990601-03-0 between EPA and Oregon DEQ) through September 30, 2003.

[b] Projected costs are based on the Cooperative Agreement for RA line items Long-Term Response/ Monitoring and General Maintenance, including DEQ costs.



ecology and environment, inc.
International Specialists in the Environment
Portland, Oregon

McCORMICK AND BAXTER
CREOSOTING COMPANY SITE
Portland, Oregon

Figure 1

SITE LOCATION MAP

Date:
9-9-03

10:001688OY022901\fig 1.cdr

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	McCORMICK AND BAXTER CREOSOTING COMPANY SITE Portland, Oregon	Figure 2 BARRIER WALL CONFIGURATION		
		Date: 10-16-03	Drawn by: AES	10:001688OY0203\fig 2.cdr

MCBSF
6.7

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
OREGON OPERATIONS OFFICE
811 S.W. 6th Avenue
Portland, Oregon 97204

September 18, 2003

MEMORANDUM

SUBJECT: Interim Remedial Action Report
Final Groundwater Operable Unit - OU3
McCormick & Baxter Creosoting - Portland

FROM: Alan Goodman
Remedial Project Manager

TO: Michael F. Gearheard, Director
Environmental Cleanup Office

THROUGH: Lori Cohen, Manager
Site Cleanup Unit 3

The purpose of this memorandum is to request your approval of the attached Interim Remedial Action Report for the Final Groundwater Operable Unit at the McCormick and Baxter Creosoting site.

The attached report documents the completion of construction of all groundwater cleanup actions specified under the Record of Decision (1996) and the Explanation of Significant Differences (2002). The last action was construction of a vertical subsurface barrier wall, completed this past summer. These actions were implemented by the Oregon Department of Environmental Quality (DEQ).

The Interim Remedial Action Report has been prepared in accordance with the January 2000 *Site Closeout Procedures Guidance*. I recommend your approval of the report.

Attachment